

Find $\frac{dy}{dx}$ if $y = x^2 \underbrace{\cos^3(\pi x)}$

$$y = \cos^3(\pi x)$$

$$y = (\cos(\pi x))^3$$

$$\frac{dy}{dx} = 3(\cos(\pi x))^2 \cdot -\sin(\pi x) \cdot \pi = -3\pi \cos^2(\pi x) \sin(\pi x)$$

$$\frac{dy}{dx} = x^2 \left(-3\pi \cos^2(\pi x) \sin(\pi x) \right) + \cos^3(\pi x) \cdot (2x)$$

$$= -3\pi x^2 \cos^2(\pi x) \sin(\pi x) + 2x \cos^3(\pi x)$$

⑪

$$s = \frac{4}{\underline{\underline{3\pi}}} \sin 3t + \frac{4}{\underline{\underline{5\pi}}} \cos 5t$$

$$y = \sin(u)$$

$$u = 3t$$

$$\frac{dy}{du} = \cos(u)$$

$$\frac{du}{dt} = 3$$

$$y = \cos u$$

$$u = 5t$$

$$\frac{dy}{du} = -\sin u$$

$$\frac{du}{dt} = 5$$

$$\frac{4}{3\pi} \cdot 3 \cdot \cos 3t$$

+

$$\frac{4}{5\pi} \cdot 5 \cdot -\sin(5t)$$

$$\frac{4}{\pi} \cos 3t + \frac{4}{\pi} -\sin(5t)$$

~~is~~

$$\frac{4}{\pi} (\cos 3t - \sin 5t)$$

$$(35) \quad y = \cot \frac{\pi u}{10} \quad u = 5\sqrt{x} \quad x = 1$$

$$y = \cot \left(\frac{\pi}{10} \cdot 5\sqrt{x} \right)$$

$$\# \quad y = \cot u \quad u = \frac{\pi}{2} \sqrt{x} \quad x^{\frac{1}{2}} \rightarrow \frac{1}{2} x^{-\frac{1}{2}}$$

$$\frac{dy}{du} = -\csc^2 u \quad \frac{du}{dx} = \frac{\pi}{2} \cdot \frac{1}{2\sqrt{x}} = \frac{\pi}{4\sqrt{x}}$$

$$\frac{dy}{dx} = -\frac{\pi}{4\sqrt{x}} \csc^2 \left(\frac{\pi}{2} \sqrt{x} \right)$$

$$\left. \frac{dy}{dx} \right|_{x=1} = -\frac{\pi}{4} \csc^2 \left(\frac{\pi}{2} \right)$$

$$= -\frac{\pi}{4}$$

$$(38) \quad y = \left(\frac{u-1}{u+1} \right)^2 \quad u = \frac{1}{x^2} - 1 \quad x = -1$$

$$y = \left(\frac{\frac{1}{x^2} - 1 - 1}{\frac{1}{x^2} - 1 + 1} \right)^2 \rightarrow \left(\frac{\frac{1}{x^2} - 2}{\frac{1}{x^2}} \right)^2 \Rightarrow \left(\frac{\frac{1-2x^2}{x^2}}{\frac{1}{x^2}} \right)^2$$

$$\Rightarrow \left(\frac{1-2x^2}{\cancel{x^2}} \cdot \frac{\cancel{x^2}}{1} \right)^2 \Rightarrow (1-2x^2)^2$$

$$y = (1-2x^2)^2$$

$$y = u^2 \quad u = 1-2x^2$$

$$\frac{dy}{du} = 2u \quad \frac{du}{dx} = -4x$$

$$\frac{dy}{dx} = -4x \cdot 2(1-2x^2)$$

$$\left. \frac{dy}{dx} \right|_{x=-1} = -4(-1) \cdot 2(1-2(-1)^2)$$

$$4 \cdot 2(-1) = -8$$

Handout do $\frac{1}{2}$ of 7-28